PATENT APPLICATION

#9
4-28-03
J. Bates

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Christian G. VAN DE WALLE

Application No.: 09/682,174

Filed: July 31, 2001

For: SEMICONDUCTOR STRUCTURES HAVING REDUCED CONTACT RESISTANCE

Group Art Unit: 2814

Examiner: L. Pham

Docket No.: 108901

REQUEST FOR RECONSIDERATION UNDER 37 C.F.R. §1.111

Director of the U.S. Patent and Trademark Office
Washington, D.C. 20231

Sir:

In reply to the March 3, 2003 Office Action, reconsideration of the above-identified application is respectfully requested.

Claims 1-20 are pending. Applicant gratefully acknowledges the indication on page 4, items 5 and 6 of the Office Action that claims 3 and 6-14 contain allowable subject matter.

Applicant thanks Examiner Pham for the courtesies extended to Applicant's representatives during the April 17, 2003, personal interview. The points discussed during the interview are incorporated into the remarks below and constitute the Applicant's record of the interview.

I. Reply to Rejections

On page 2, item 2 of the Office Action, claims 4, 8 and 9 are rejected under 35 U.S.C. §112, second paragraph, as indefinite. Specific language is cited as the basis of the rejection. The rejection is respectfully traversed.

Applicant submits the specification apprises one of ordinary skill in the art the metes and bounds of each of claims 4, 8 and 9. Regarding claim 4, the specification at paragraph [0042] discloses that the composition of the semiconductor interlayer closest to the metal layer can be varied by diffusing a portion of the metal layer closest to the adjacent semiconductor interlayer into that semiconductor interlayer. In other words, metal ions from the metal layer may be diffused into the semiconductor interlayer closest to the metal layer and vise-versa.

Regarding claims 8 and 9, the specification at paragraphs [0037], [0038] and [0039] apprises one of ordinary skill in the art the clear meaning of claims 8 and 9. Therefore, it is respectfully submitted that claims 4, 8 and 9 fully comply with 35 U.S.C. §112 and withdrawal of the rejection of claims 4, 8 and 9 is respectfully requested.

On page 3, item 4 of the Office Action, claims 1, 2, 4, 5 and 15-20 are rejected under 35 U.S.C. §103(a) over U.S. Patent No. 6,100,586 to Chen et al. (hereinafter "Chen"). The rejection is respectfully traversed.

The Office Action acknowledges that Chen fails to disclose a semiconductor device having a second conduction band energy level and a second valence band energy level, and a metal layer formed over the second p-doped group III-V semiconductor layer and having a Fermi energy level, wherein the Fermi energy level is above the first and second valence band energy levels and the second valence band energy level is between the Fermi energy level of the metal and the first valence band energy level, as recited in claim 1. The Office Action asserts that these claimed features are inherent in the layers of Chen. Applicant respectfully disagrees.

These features are not an inherent result of the processing step as alleged by the Office Action. Chen discloses a metal layer 134, a p-type Gallium Nitride material layer 118 and a conductive intermediate layer 132 sandwiched between the Gallium Nitride material

layer 118 and the metal layer 134 (see col. 5, lines 25-30). Chen discloses that the intermediate layer 132 is a group III-V semiconductor layer having a high band gap energy, but one that is lower than that of the p-type Gallium nitride material layer 118. The intermediate layer 132 is doped to as high a level as possible with acceptor impurities to make the resistivity of the intermediate layer as low as possible and to make the depletion zone in the intermediate layer as narrow as possible (col. 5, lines 55-64).

Nowhere in Chen is there disclosure or suggestion of the particular relationship of a first conduction band energy level, a first valence band energy level, a second conduction band energy level and a second valence band energy level, a Fermi level or the relationship of the first and second valence band with the Fermi energy level of the metal. Chen merely discloses that an intermediate layer is one with a low band gap energy than the Gallium Nitride layer 118 (see col. 5, lines 55-64). In fact, the relationship of the valence band and the Fermi level varies depending on many factors, one of which is the level of doping. Other factors are the level of stresses in the crystal structure of the semiconductor. As a result, the particular relationship recited in claim 1 is not inherent as alleged.

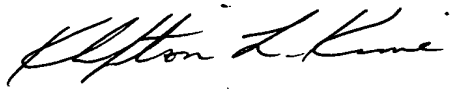
Therefore, it is respectfully submitted that claim 1 is patentable over Chen. Further, it is respectfully submitted that claims 2, 4, 5 and 15-20 are patentable at least in view of the patentability of claim 1 from which they depend, as well as for the additional features they recite. Withdrawal of the rejection of claims 1, 2, 4, 5 and 15-20 is respectfully requested.

II. Conclusion

In view of the foregoing, Applicant submits that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-20 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner is invited to contact Applicant's undersigned representative at the telephone number set forth below.

Respectfully submitted,



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